

The University of Chicago

THE NATURE AND CAUSES OF
REGRESSIVE MOVEMENTS IN READING

A PART OF A DISSERTATION SUBMITTED TO THE FACULTY OF THE DIVISION
OF THE SOCIAL SCIENCES IN CANDIDACY FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF EDUCATION

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By
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EVALYN BAYLE

*Editor, Webster Publishing Co.
St. Louis, Mo.*

From the time that Laval in 1879 called attention to the fact that the passage of the eye across a line of print is discontinuous, consisting of movement and pauses, psychologists have found the study of eye movements a provocative field. These movements are concerned with both a sensory process, perception, and a thought process, assimilation of ideas. Consequently they offer a method of examining the activities of the mind through a motor manifestation which is automatic and reflex in character.

Eye-movement studies have concerned themselves with patterns of eye movements exhibited for the various levels of learning, for different types and purposes of reading, and for oral as contrasted to silent reading. Attention has been called to possibilities for modifying patterns of eye movements through various types of training and teaching. In fact, the whole nature of the reading process has been clarified in the psychological laboratory through eye-movement studies.

As a result the terminology of eye movements has been standardized: the number of fixations in relation to the length of the line indicates the span of recognition; the duration of these fixations shows the speed of recognition; the number of regressive movements gives evidence as to the regularity of the reader's progress across the lines of print. Factors which affect each of these measures of the reading process have been studied and important conclusions reached.

Regressive movements are movements of the eyes backward rather than forward. The problem of regressions is important, because inherent in them is evidence of factors which interrupt the normal progress of reading. Regressions are regarded as unconscious adjustments of the eyes to some failure in the process of comprehension or of perception. Where the material read offers no real ob-

stacle to perception or to comprehension, the eyes move forward in rhythmic fashion; when difficulties appear, their movements are interrupted as attention is diverted to a reconsideration of textual elements.

The fact that when the difficulty of textual material is increased, the number of regressions increases, both for mature and immature readers, has been demonstrated experimentally. The literature on eye movements has also considered what factors in general can be expected to produce regressions: difficulties in vocabulary or in thought, level of reading ability, purposes of reading, attitudes when reading, and the nature of the material read. Some analysis of the nature of regressions has been made in various studies: distinctions have been drawn between regressions at the beginning of a line caused by an inaccurate return sweep from the end of the preceding line, regressions caused by inability to attach meaning to a word, and regressions produced by mature readers who have made too long a forward movement and must regress to pick up what was missed. The possibility of reducing undesirable regressions has been demonstrated experimentally.

THE PROBLEM IN THIS STUDY

So far as the writer knows, no attempt has been made to study the causes of regressions within the line beyond calling attention to "difficulty." It seems probable that difficulties in interpreting meaning beyond those implied in the recognition and comprehension *per se* of words and phrases might, in thoughtful reading, produce regressions even for readers of mature habits. If similar difficulties in interpretation tend to cause the regressions to fall into patterns which resemble each other, this should provide evidence of value in understanding the mental processes present in apprehending meaning in reading. It is conceivable that regressive movements may represent the only possible method of adjustment to certain difficulties, and may

*A part of a dissertation submitted to the faculty of the Division of the Social Sciences in Candidacy for the Degree of Doctor of Philosophy, Department of Education, University of Chicago, 1941.

serve as evidence under certain conditions that the mind of the reader is engaged actively with the process of interpreting the material before him. Conversely, the absence of regressive movements for a reader who is faced with certain interpretative difficulties may indicate that he is reading mechanically, with little real understanding of the material his eyes are passing over.

The study reported here was undertaken to investigate the difficulties which cause regressions. It also included a study of the nature of regressions and an attempt to classify them according to pattern and cause.

The procedure was two-fold: (1) analysis of existing eye-movement records in order to discover the various patterns that regressions tend to fall into, and of the copy which produced these regressions to discover possible causes for the patterns; (2) setting up copy which incorporated the factors suspected of causing regressions, and testing out the hypotheses by making eye-movement records of skilled readers from this copy.

The preliminary study of regressive movements, based on eye-movement records of Selections 1 and 2 taken in the course of previous experimentation, resulted in several hypotheses as to the nature and the causes of regressive movements in reading. Regressions seemed to fall into six patterns: (1) initial regressions, (2) corrective regressions, (3) reference regressions, (4) word analysis patterns, (5) phrase analysis patterns, and (6) line analysis patterns. The causes for these patterns apparently lay in the nature of the text: difficulties in interpretation of meaning inherent (1) in word order, (2) in word groupings, (3) in a misleading juxtaposition of certain words, (4) in lack of punctuation to help make the meaning clear, (5) in shifts in the meanings of words, and (6) in the necessity for concentrating on key words or key elements in sentence units.

Also considered worth further study were these four things: (1) in the case of initial regressions, the manner in which the preceding line "broke" the thought, (2) the effect of the length of lines used, (3) the effect of the length of the selection being read, and (4) the effect of the "solidness" or "openness" of a line, as represented by the amount of white space used in it.

The first step, then, in the experimental study of regressive movements was to set up

copy which would incorporate these factors in such a way that eye-movement records made while they were being read would test the hypotheses.

The process of preparing this copy was one of trial and error, various forms being tried out before the eye-movement camera until the final drafts were thought acceptable. In addition to including certain types of difficulty in the text to be used in the final experiment, many other problems had to be faced. It was decided to present the test material to the subjects in typewritten form. This necessitated writing the copy in such a way that the lines could be made fairly even in length; as a matter of fact, in three of the selections the right hand margin was kept even except for an occasional punctuation mark; in the fourth selection, lines were purposely made of different lengths. Second, it was necessary to locate the test difficulties within the lines in such a way that the effect of each could be kept separate from that of other factors to as great an extent as possible. Third, it was believed that the position of these difficulties should not be the same in each line, and an effort was made to distribute them among the first, second, and last thirds of the lines in which they appeared when they were of such a nature that they could be so distributed.

It was further assumed that the subjects for the experiment should have a chance to get into the trend of the selection and presumably "strike their stride" in reading before test factors which were to be studied should be introduced. Accordingly, an effort was made to write the selections in such a way that the reader's interest might be caught by the opening lines and carried on through the whole selection. The last lines only were counted as test lines, and those appearing before this (seven for Selection 3, and six for Selections 4 and 5) were considered as "warm-up" lines. Selection 1-x, for reasons to be explained later, consisted of only twelve lines in all.

A five-inch line was decided upon as being the best approximation of the standard reading page of typewritten material. However, because of the demands upon the copy already discussed and the necessity for having that copy present material which was interesting, certain variations were necessary. Selection 1-x, because it was an adaptation of

a selection used in the records examined in the preliminary study of regressions, has a line length of four and seven-eighths inches, and Selection 3 of the desired five inches. The nature of the copy used for Selection 5 produced lines varying from three to seven inches in length.

To give the subjects practice in reading before the eye-movement camera, it was decided to present all directions for the experiment in typewritten form, and to have them read before the actual photographing of eye movements should begin. Accordingly the directions were worked out so that their form approximated that of the test selections, and were presented to the subjects in exactly the same way as the test materials. These directions were tried out in preliminary experimentation, as were the test selections, and wherever there was any ambiguity, changes were made to correct it. Graduate students in the Department of Education served as subjects in this preliminary testing.

Because limitations of the field of vision before the eye-movement camera prevent the use of too long a selection and because of the difficulty inherent in writing one continuous selection which should incorporate all the factors to be tested, three different test paragraphs were prepared. A fourth paragraph was adapted from Selection 1 as a kind of control selection. The copy used in the experiment was typed in pica type, double spaced, and was presented to the subjects

without the titles used here for purposes of distinguishing the selections from one another.

The text of the materials used in the final experiment is given in the following pages. They are presented here in the same order as that in which they were placed before the subjects. Following the presentation of each passage significant characteristics will be discussed.

Selection 3 was intended to test the effect of shifts in the meanings of words upon eye-movement patterns. It also included certain other test factors.

This selection is an adaptation of a paragraph found in a story from the *Saturday Evening Post* of November 9, 1940. It was felt that its narrative style would capture the interest of the readers, and that the trend of its ideas would not be beyond their comprehension, even though its metaphorical style offered opportunity to study the effect of such phrases on the pattern of eye movements. The test lines begin with "stand extra expense," line 8. Enough of the slang appears before this point to enable the reader to adjust to it, so that the first test line should not produce a pattern of regressions due simply to a sudden introduction of something new and unexpected.

Two lines end with hyphenated words; it was expected that the next lines, beginning with the rest of the word in each case, might show an effect from this insofar as initial regressions are concerned. In one case, it is

SELECTION 3

Line

1 In August, 1919, the baby was born and her mother
2 died. Tom came back to Chicago and brought the baby
3 with him. He still had some dough in the bank, and
4 he had this job with the *Register*. He had been with
5 newspapers all his life and so he went back to work.
6 It was up to him to learn to care for the baby also.
7 He always had three squares a day, but he could not
8 stand extra expense when he was down to buttons, on
9 the shorts for groceries and rent and shoes for the
10 baby. He became an expert at carefully fixing for-
11 mulas, washing clothes, and bathing the small scoot.
12 And of course she grew, grew like a bad wee. Final-
13 ly came a day when she came paddling into where Tom
14 was having his breakfast, swarmed up into his chair,
15 and began to get off long flights of conversational
16 noises, with gestures. She began to visit with him,
17 constructing sentences of mouthings and blabberings
18 which sounded like real conversation.

not hard to anticipate the ending of the word so hyphenated; in the other, the intention was to use a word in which the ending could not be so anticipated.

Scoot and *wee* are unusual, but not unintelligible, terms to substitute for *baby*. The use of *wee* in connection with *grew like a bad* might be expected to have one of two effects: either the reader would fail to notice that the expected word was not used, or he would be impelled to check up to be sure that he was not misreading. The use of an inversion (*came a day*) and a repetition (*grew, grew*) might have some effect on eye-movement pattern. Words like *paddling*, *swarmed*, *flights*, *mouthings*, and *blabberings* were introduced to test the effect of shifts in the meanings of words. To understand the trend of the passage, it is necessary for the reader to fit such words into the general context. This calls for the rejection of the basic meaning in favor of one which will fit this context.

The next to the last line was made to consist of words of more than average length, in contrast to lines made up of short words.

Selection 1-X was introduced as a kind of control selection. The text of this selection follows.

This selection is the same as Selection 1, used for the eye-movement records in a previous study which were examined in the preliminary study of regressive movements. Since, however, in this experiment the materials to be read were presented in typewritten form, it was necessary to make a few minor changes in the wording and punctuation in order to keep the lines even.

Since this selection has been used before and data are available as to the number of regressions produced in those studies, it was

included in this study as a sort of control selection. Its simple form, vocabulary, and ideas made it seem probable that the present subjects might show their most normal pattern of eye movements in reading this selection, in contrast to the pattern which they were expected to show in reading the other test materials.

Selection 4 was planned to test the effect of unfamiliar words and of certain perceptual factors upon eye-movement patterns. The first test line in this selection, line 7, is made up of 11 short words, in contrast to line 17 of Selection 3 and line 14 in this selection, where there are only a few long words to the line. Line 8 introduces a vocabulary factor; it has been established that a common type of regression appears where the reader is under the necessity of trying to recognize an unfamiliar word, and this word *scriptgiser* is entirely unrecognizable, having been invented for the purposes of this experiment. This applies also to *gisscrifter* in the next to the last line. Line 9 was expected to produce a zigzag pattern across the whole line if the reader was involved in trying to make meaning out of the relation of the term *cowgirl* to *father*, as he should be if he is concerned with interpretation.

Two words are split with hyphens at the ends of lines to give additional evidence as to the effect upon initial regressions.

In three places misspellings are introduced; two of these consist in the doubling of a final letter at the end of the line. Such misspellings should be noticed by intelligent students if they fall well within the span of attention; however, since the last fixation on a line ordinarily is located a short distance in from the end of the line, it might be expected

SELECTION 1-X

Line

- 1 At the Battle of King's Mountain a young
- 2 Mr. Black was badly hurt. His colored servant
- 3 saw that his master had been left to die, and
- 4 carried him to the next town. There he hunted
- 5 until he found a doctor. The young man lived.
- 6 After the war, he gave the Negro a cottage on
- 7 his place. Always on the day of the Battle of
- 8 King's Mountain a big dinner was prepared for
- 9 the old servant. He sat alone at the head of
- 10 the master's table, and was served by the two
- 11 daughters of the family. This was done every
- 12 year that the old man lived.

SELECTION 4

Line

1 Books about the great northwest are very popular
 2 nowadays, and so are books which arise from the
 3 childhood days of the author. On the best-seller
 4 list for this month is the latest volume from the
 5 pen of Daniel Peterkin, entitled *Stranger Lives*.
 6 Memories of his own boyhood in the Canadian West
 7 are the source of ten of the stories in this book
 8 by a scriftgiser. Before he married and took up a
 9 homestead, the writer's father had been a cowgirl.
 10 He had been a hot-headed fist-shaker, finally set-
 11 tling down only after he began to farm. Father's
 12 picture in this book has warmth and a rich humann
 13 dignity. His biggest objection to farming was the
 14 gradually diminishing solitude when homesteaders
 15 settled nearby. This is handled by the skillfull
 16 gisscriter with humor. "I just don't like hav-
 17 ing strangers in my pocket," father explained.

that these final letters would fall in the outer fringes of the perception span. It was felt that by incorporating such factors into the copy, some evidence might be obtained as to the need for corrective regressions. As a check upon this, one misspelled word, *bigest*, was placed within the line.

The last selection, the text of which is given next, presented certain other problems,

chief of which were the effect of lack of punctuation and of lines varying in length.

The "warm-up" lines for this selection consist of a comment upon the material to be read, as a sort of introduction designed to arouse interest in and curiosity about the poem which follows. Since the lines of the poem are of uneven length, this preliminary material was set up with lines equally uneven

SELECTION 5

You are now to read a rather simple poem.

It is not written in regular form, with regular meter and rhythm, but rather in a half prose style. This will make it easier for you to read it. When you have finished the reading, you should be able to tell what thoughts the poet had in mind on each of the two occasions with which he deals here.

When I read a book, a biography famous,
 And is this then said I what the author calls a man's life?
 And so will someone when I am dead and gone write my life?
 As if any man really knew aught of my life!
 Why even I myself I often think know little or nothing of my
 real life,
 Only a few hints, a few faint clews and indirections
 I seek for my own use to trace out in this book.

When I see a chest, a treasure chest,
 And so, then, this, said I, is what men store their treasures in?
 And thus will my treasures when I am dead and gone be stored away?
 As if any man could really know my riches!
 Really, I think, even I, the poet, do not know what my riches are,
 Only some memories, faded clues to happiness
 Which I hold precious for my own remembering.

and in about the same arrangement as the poem shows. This was for the purpose of accustoming the reader to the arrangement before he came to the actual test lines.

The first part of the poem is one of Walt Whitman's *Inscriptions*.¹ A few minor changes have been made in punctuation and in wording. Since it was not possible to expect comparable results from the lines of this selection and those in the other selections, because of the differences in length, a second stanza was prepared which would provide contrasts with the lines of the first one. In the first line of the first stanza, an inversion appears, but in the comparable line of the second stanza there is no such inversion of word order. Several lines in the first stanza are difficult to interpret because of lack of punctuation; in the second stanza lines comparable in difficulty of idea are punctuated. Care was taken, however, to vary the form of the line enough to obviate practice effect.

There are many places in this selection where the order of the words and phrases might cause difficulty in interpretation. Several vocabulary factors might also cause trouble: *ought*, *so*, *indirections*, *clews* (the spelling) were recognized as possible obstacles to interpretation. It will be noticed that the spelling *clues* is used in the second stanza. If the difference was noticed, it might produce a regression away from the next to the last line to the line in which the word was first used.

Selection 5 might be expected to produce the most initial regressions of the three test selections, if the length of line is a factor. Dearborn attributed initial regressions to the failure of the eyes to establish "short-lived motor habits" which enable a reader to repeat in subsequent lines that length of return movement which will enable him to begin the reading at the proper point. Obviously in reading lines varying so much in length no such habit is established.

THE EXPERIMENTAL PROCEDURES

The subjects used in the experimental study of regressions were ninth and tenth grade pupils from the University of Chicago High School. Thirty-five pupils from these grades were chosen on the basis of their percentile ranking on the Iowa Silent Reading Test. However, it was found later that 3 of

¹ Walt Whitman, *Leaves of Grass*, p. 7. Emory Holloway, Editor. New York: Doubleday, Doran and Co., 1931.

these pupils reread so much on every selection that it was impossible to plot the films obtained from them, so that the size of the experimental group was cut to 32. Some records were lost during the experiment, but usable films were obtained from 31 subjects for Selection 1-x, 32 subjects for Selection 3, 31 subjects for Selection 4, and 28 subjects for Selection 5.

The median score on the Iowa Silent Reading Test for the tenth grade subjects was 104, which is equivalent to the ninety-seventh percentile. The median score for the ninth graders was 98, with a corresponding percentile rank of 96. No reader in either group was below the eighty-eighth percentile on the Iowa Silent Reading Test.

The median score for the tenth grade subjects on the American Council Psychological Test was 122, convertible into the eighty-seventh percentile. For the ninth graders, the median score was 114, which made their percentile rank on this test 89.

There were 13 tenth grade subjects and 19 ninth grade subjects. No attempt was made to keep the two groups separate. The whole group was considered as homogeneous insofar as reading and intelligence are concerned, and these factors only were considered as having a bearing upon the experimental results.

In testing out the hypotheses which were set up subjectively in the preliminary study as to the nature and causes of regressions, it was decided that only good readers should be used. It is known that people who approach mature habits of reading tend to make fewer regressions even in the presence of difficulties. Poor readers, on the other hand, tend to make many more regressions than good readers, even on easy material. It was expected that in the experiment regressions would be caused by test factors. The use of poor readers for subjects would have covered up the possible relationships between the difficulties introduced and their production of regressions, while the use of skilled readers tends to eliminate the types of regressions that are symptoms only of immaturity in reading skill.

The fact that there were appreciable variations between the various lines of the selections, both in number of fixations and number of regressions for the majority of the subjects, bears out this assumption. On easy and uncomplicated material, eye-movement patterns

characteristic of mature readers appeared; the pattern was altered when difficulties were introduced.

Comprehension tests on each selection were given following the taking of the eye-movement records. Five questions were asked on each selection. An effort was made to use questions which would test, not memory of detail, but the implications of each selection. It was decided beforehand that three correct answers for a selection would indicate adequate comprehension; four, very good comprehension; and five, excellent comprehension. By this measure, 6 per cent of the subjects did not have adequate comprehension on Selection 1-x and Selection 4, and 7 per cent on Selection 5. This means only two

people in each case. On the other hand, 71 per cent had very good or excellent comprehension on Selection 1-x and Selection 4, 100 per cent on Selection 3, and 68 per cent on Selection 5.

TYPICAL EYE-MOVEMENT RECORDS ON THE TEST SELECTIONS

Before analyzing the results from the experiment, it might be well to illustrate the kind of eye-movement patterns exhibited in the reading of the three test selections. Typical records for each are reproduced in Figures 1, 2, and 3. These records have been carefully chosen not only to represent the average number of fixations and regressions for the group as a whole, but also to show

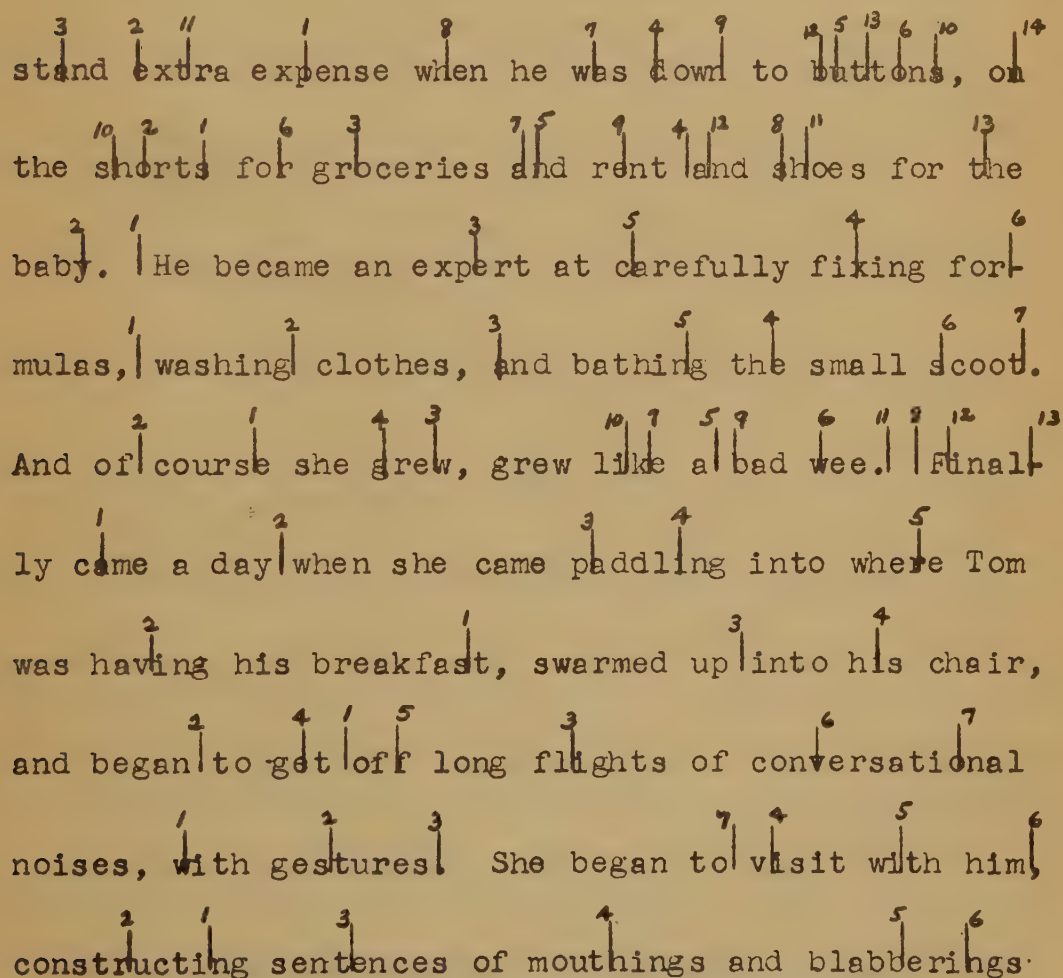


Fig. 1.—Eye-movement record of Subject 14 reading Selection 3.

the typical positions that those fixations and regressions took over the test factors introduced into the copy. By following through the order of the fixations on each line, as shown by the numbering, the pattern of regressions can be seen. Later, typical lines will be graphed in detail to show this more clearly.

The most significant thing about these records is the wide variations that are revealed in the number of fixations and regressions for the different lines. Figure 1 shows the reading of Subject 14 for Selection 3. On Selection 1-X, the control selection, she averaged 6 fixations and 1.6 regressions per line. On Selection 3, the record of which is shown here,

she varied from 4 to 14 fixations per line, and from none to 6 regressions, with an average of 8.2 fixations and 2.3 regressions. Such variations are typical of the majority of the subjects, and seem to be evidence in themselves of the effect of difficulties in interpretation. Where the line is easy and uncomplicated, the reader seems able to read with maximum efficiency; when difficulties appear, the eye movements reflect them in direct proportion to the amount of analysis they required before becoming clear.

Figure 2 shows how Subject 32 read Selection 4. Here again there are variations in number of fixations and regressions per line,

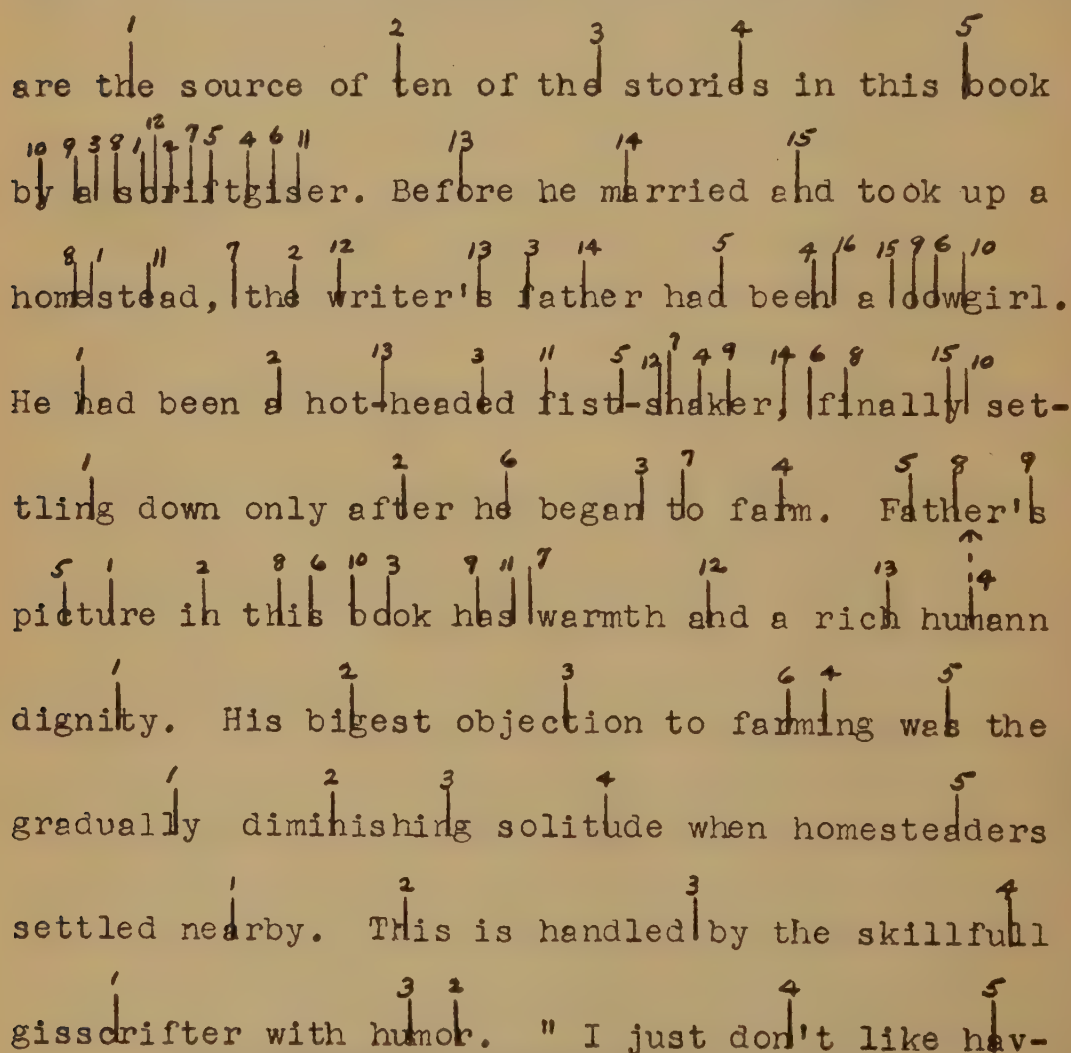


Fig. 2.—Eye-movement record of Subject 32 reading Selection 4.

the fixations ranging from 4 to 16, and the regressions from none to 8, with averages of 9.3 and 2.4 respectively. On Selection 1-x this subject averaged 6.7 fixations per line and 1.3 regressions; on Selection 3, 6.5 fixations and 1.1 regressions. The record shown here for Selection 4 reveals the average for the group in number of fixations and regressions, and the pattern of eye movements again is illustrative of what happened when the majority of the subjects read this selection.

Figure 3 shows the reading of Selection 5 by Subject 12, with a total of 129 fixations and 31 regressions for the selection. Because of the difference in line length in this selec-

tion, the results cannot be compared with those on the other selections. However, two things stand out in this record, and in the records of practically every one of the 28 subjects from whom records were obtained on this selection. The first is the tendency of the reader to shorten the span of recognition and to move along regularly and cautiously over the lines. This may have been due to the effect of the "warm-up" lines which preceded the poem itself and which warned the reader of the questions he would be asked on the poem. Or it may have been due to the varying lengths of the lines. In any event, it is obvious that this selection was read cauti-

When I read a book, a biography famous,
 And is this then said I what the author calls a man's life?
 And so will someone when I am dead and gone write my life?
 As if any man really knew aught of my life!
 Why even I myself I often think know little or nothing of my real life,
 Only a few hints, a few faint clues and indirections
 I seek for my own use to trade out in this book.
 When I see a chest, a treasure chest,
 And so, then, this, said I, is what men store their treasures in?
 And this will my treasures when I am dead and gone be stored away?
 As if any man could really know my riches!
 Really, I think, even I, the poet, do not know what my riches are,
 Only some memories, faded clues to happiness

Which I hold precious for my own remembering.

Fig. 3.—Eye-movement record of Subject 12 reading Selection 5.

TABLE I
REGRESSIONS PRODUCED ON EACH LINE OF THE FOUR SELECTIONS

Line	Total Number of Regressions	Average Number of Regressions	Number of Initial Regressions	Per Cent of Subjects Making Initial Regressions	Number of Internal Regressions	Average Number of Internal Regressions	Per Cent of Total Number of Internal Regressions
Selection 1-x (31 Subjects)							
2-----	65	2.1	19	61	46	1.5	17
3-----	37	1.2	16	52	21	0.7	8
4-----	54	1.7	21	68	33	1.1	12
5-----	53	1.7	22	71	31	1.0	12
6-----	51	1.6	21	68	30	1.0	12
7-----	45	1.5	19	61	26	0.8	10
8-----	43	1.4	13	42	30	1.0	11
9-----	32	1.0	13	42	19	0.6	7
10-----	23	0.7	10	32	13	0.4	5
11-----	33	1.1	17	55	16	0.5	6
Total-----	436	14.0*	171	65	265	8.6*	100
Selection 3 (32 Subjects)							
8-----	83	2.6	22	69	61	1.9	14
9-----	65	2.0	17	53	48	1.5	11
10-----	47	1.5	17	53	30	0.9	7
11-----	67	2.1	25	78	42	1.3	9
12-----	95	3.0	25	78	70	2.2	16
13-----	58	1.8	16	50	42	1.3	9
14-----	61	1.9	19	59	42	1.3	9
15-----	70	2.2	16	50	54	1.7	12
16-----	52	1.6	18	56	34	1.1	8
17-----	40	1.3	18	56	22	0.7	5
Total-----	638	19.9*	193	60	445	13.9*	100
Selection 4 (31 Subjects)							
7-----	54	1.8	15	50	39	1.3	6
8-----	119	4.0	18	60	101	3.4	16
9-----	138	4.6	13	43	125	4.2	20
10-----	97	3.2	20	67	77	2.6	12
11-----	65	2.2	15	50	50	1.7	8
12-----	80	2.7	20	67	60	2.0	9
13-----	53	1.8	15	50	38	1.3	6
14-----	57	1.9	19	63	38	1.3	6
15-----	41	1.4	11	37	30	1.0	5
16-----	96	3.2	20	67	76	2.5	12
Total-----	800	26.7*	166	55	634	21.1*	100
Selection 5 (28 Subjects)							
7-----	82	2.9	25	89	57	2.0	8
8-----	122	4.4	18	64	104	3.7	14
9-----	109	3.9	22	79	87	3.1	12
10-----	94	3.4	27	96	67	2.4	9
11-----	77	2.8	19	68	56	2.0	7
12-----	67	2.4	25	89	41	1.5	5
13-----	58	2.1	23	79	35	1.3	5
14-----	62	2.2	25	89	37	1.3	5
15-----	68	2.4	16	57	52	1.9	7
16-----	92	3.3	20	71	72	2.6	10
17-----	65	2.3	22	79	43	1.5	5
18-----	81	2.9	17	61	64	2.3	9
19-----	59	2.1	25	89	33	1.2	4
Total-----	1,036	37.0*	284	78	752	26.9*	100

* Figured on the basis of the total number for the selection.

ously rather than with a free style, in which the reader forged rapidly ahead and made regressions when necessary.

The second thing that stands out in the records for Selection 5, and which is illustrated in the example given in Figure 3, is the difficulty the readers had in getting back to the beginning of the next line with any degree of accuracy when the preceding line was one of the longer ones. Only one line in this record for Subject 12 is without an initial regression, and six of the lines required two extra fixations in order to read the part of the line coming before the position of fixation 1. In many of the records on this selection, the process of returning to the beginning of the next line is facilitated by regressions part way back in the line just read.

It will be seen that there is a curious lack of points in Figure 3 at which fixations tend to pile up on words, or even on phrases, because of regression patterns. This is noticeable in the majority of the records on Selection 5.

Table I presents the complete data on regressions for the four selections used in the experiment. It will be seen that there are wide variations among the lines in the various selections in the number of regressions produced. The range in initial regressions, in per cent of the total number of subjects who made such regressions on the different lines, is from 32 to 96 per cent. The range in internal regressions, in terms of the per cent contributed to the total number for the selection by each line, is from 5 to 20 per cent. The wide range in each case can only be explained by the differences in the difficulty presented to the reader by the various lines.

INITIAL REGRESSIONS

There is no evidence from this experiment of any relationship between initial regressions and the position of the line in the selection or the sentence element beginning the line. There is ample evidence of a relationship be-

tween the distance of the first fixation from the beginning of the line and the need for an initial regression on that line. A tabulation made of the distances for all lines in Selections 3 and 4 is given in Table II. In measuring the distance of the first fixation in from the beginning of the line, all fixations within the first centimeter were put together, all those within the second, and so on. When the fixation came on the dividing line, it was counted in with the lower measure.

It will be seen from the data on a total of 600 lines given in Table II that the farther in from the end of the line the first fixation falls, the more likely it is to be followed by a regressive movement. Only 10 per cent of the fixations falling within the first centimeter of the line were followed by a regression, while each of those falling in the sixth and seventh centimeters was followed by a regression. There is a steady increase in the percentages as the distance of the first fixation from the beginning of the line increases.

This evidence of the relationship between the position of the first fixation on the line and the need for an initial regression leaves unanswered the question as to what causes the reader to fixate at an inappropriate distance from the beginning of the line. For the abnormal distances there is a possibility that the eye of the reader has been caught by some physical factor within the line, such as a punctuation mark or the configuration of a familiar word. There is the possibility also that such a first fixation may have fallen on the previous line, though there is no evidence in the films to show this. Ordinarily such a regression could be distinguished by the angle of the return sweep. Another possible explanation for such large inaccuracies in the return sweep is that the mind of the reader is occupied with the meaning of something just read and this first fixation represents a wandering of the eye rather than a fixation for perception.

The line beginning with a word continuation, *mulas*, in Selection 3 had 3 first fixations

TABLE II

RELATIONSHIP OF POSITION OF THE FIRST FIXATION TO THE PRODUCTION OF INITIAL REGRESSIONS

	Division of Line							Total
	1st Cm.	2nd Cm.	3rd Cm.	4th Cm.	5th Cm.	6th Cm.	7th Cm.	
Number of first fixations.....	83	235	193	67	16	5	1	600
Number followed by regression	18	125	144	57	15	5	1	355
Per cent followed by regression	10	53	75	85	94	100	100	59

falling within the first centimeter, 13 in the second, 10 in the third, and 5 in the fourth. The line in the same selection which produced the same percentage of initial regressions, 78, beginning with *And of course she*, had 2 first fixations in the first centimeter, 6 in the second, 15 in the third, 4 in the fourth, and one each in the fifth, sixth, and seventh centimeters. It would seem from this evidence that the *for-* at the end of the preceding line in the first case had caused readers to make a special effort to fixate accurately at the beginning of the line which finished the word. Even then, a regression was needed for the majority of the subjects to recognize the second part of the word. The line beginning with the last syllable of the word *finally* showed approximately the same number of first fixations in the second centimeter as for the line beginning with *mulas*. However, there was not the same need, apparently, in this line for a closer look at the word ending, and consequently there were 28 per cent less initial regressions for this line.

Perhaps there is some factor involved in the end of a line which in some cases impels the reader to an effort for accurate fixation at the beginning of the next line and in others impels him to take a chance on the success of a shorter return swing. In such cases the factor might be a physical one, such as a

word continuation or a punctuation mark. It may be in other cases a matter of the interpretation of word combinations or of ideas. These interpretative factors probably will always be subject to individual variations. That the experimental records made with skilled readers showed variations, often large, between the effects of different lines on production of initial regressions seems to point to some such explanation.

PATTERNS OF REGRESSIONS ON SELECTION 3

Table III summarizes the data on patterns of internal regressions on Selection 3. It will be seen that the test factors caused difficulty for one-half or more of the readers for all test lines except lines 15 and 17. Fifteen per cent of the adaptations to difficulty were by shortened span rather than by regression patterns. Of the 110 cases where the adaptation was by regression patterns, 82 per cent were by phrase analysis and 18 per cent by line analysis.

Figure 4 shows the plotting of a typical phrase analysis pattern of regressions in the reading of line 12 in Selection 3. A separate printing of the line is used for each direction of movement of the eyes. The numbers above the lines representing the points of fixation indicate the order of the fixations, and the

TABLE III
PATTERNS OF REGRESSIONS ON TEST FACTORS IN SELECTION 3

Line	Word Analysis	Phrase Analysis	Line Analysis	All Patterns	Shortened Span	No Difficulty	Number of Cases _a
8 (buttons)-----	-----	12	4	16	-----	15	31
9 (shorts)-----	-----	14	6	20	-----	11	31
11 (scoot)-----	-----	12	2	14	13	4	31
12 (wee)-----	-----	18	3	21	5	5	31
13 (paddling)-----	-----	11	1	12	6	13	31
14 (swarmed)-----	-----	10	3	13	6	12	31
15 (get off)-----	-----	12	1	13	-----	18	31
17 (mouthings blabberings)-----	-----	1	-----	1	8	22	31
Total-----	-----	90	20	110	38	100	248
Per Cent-----	-----	82 _b	18 _b	45 _c	15 _c	40 _c	100

• One record could not be analyzed for pattern because of movement.
• Based on total number of patterns.
• Based on total number of cases.

And of course she grew, grew like a bad wee. Final-
 And of course she grew, grew like a bad wee. Final-
 And of course she grew, grew like a bad wee. Final-
 And of course she grew, grew like a bad wee. Final-
 And of course she grew, grew like a bad wee. Final-
 And of course she grew, grew like a bad wee. Final-

Fig. 4.—Phrase analysis pattern of regressions in the reading of line 12, Selection 3, by Subject 14.

stand extra expense when he was down to buttons, on
 stand extra expense when he was down to buttons, on
 stand extra expense when he was down to buttons, on
 stand extra expense when he was down to buttons, on
 stand extra expense when he was down to buttons, on
 stand extra expense when he was down to buttons, on

Fig. 5.—Phrase analysis pattern of regressions in the reading of line 8, Selection 3, by Subject 26.

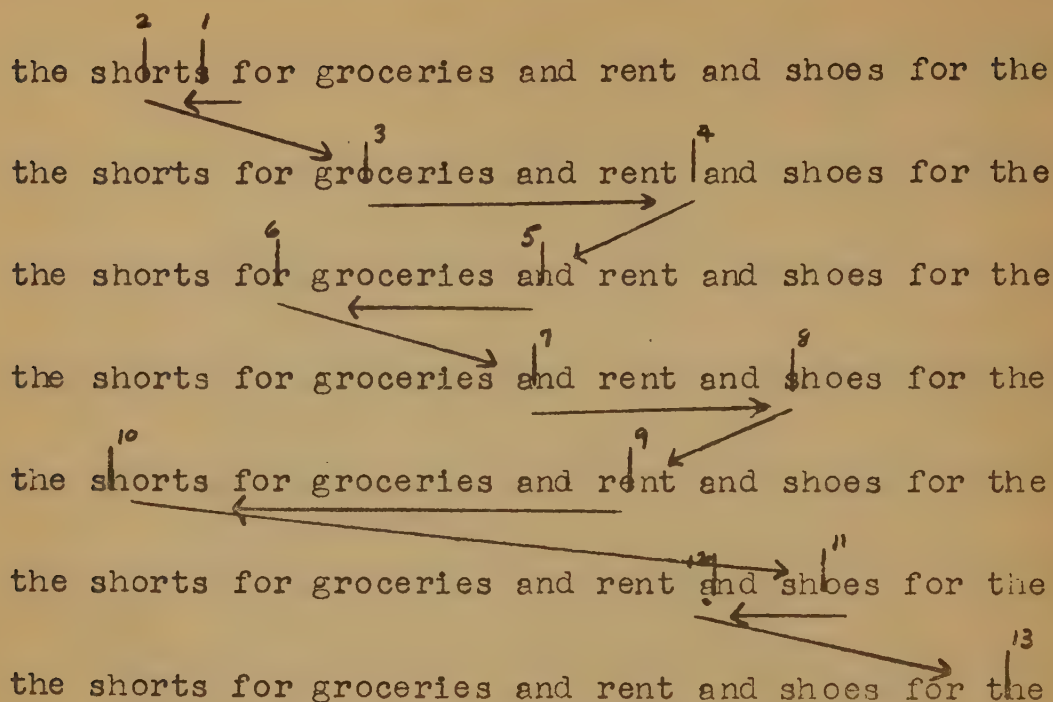


Fig. 6.—Line analysis pattern of regressions in the reading of line 9, Selection 3, by Subject 14.

arrows show the direction in which the reading is proceeding at the moment.

It will be seen that fixation 1 in this record falls quite far in from the beginning of the line and is followed by a regression. Fixation 4 may be a corrective regression, made to compensate for too long a forward movement from fixation 2 to fixation 3. The alternating forward and backward movements of the eyes over the phrase *like a bad wee* seem to indicate quite clearly that it was hard for this reader to interpret the combination of words.

Figure 5 shows a phrase analysis pattern over a part of line 8 in this selection. Figure 6 shows a line analysis pattern over line 9.

The phrase analysis pattern was the commonest form of adjustment to the type of test factor used in Selection 3. It is significant that, in attempting to interpret the meaning of such words as *buttons*, *scoot*, and *wee*, the reader examined the context in which it appeared. These words represent a kind of interpretative difficulty in which the basic meaning of the word must be rejected in favor of a figurative meaning. Apparently the process of interpretation in such cases is by examining the word in relation to the other

words with which it appears through a regression pattern. In only 18 per cent of the cases where regression patterns appeared was line analysis used. The highest number of line analyses, six, was used in reading line 9, where the word *shorts* appeared near the beginning of the line; the largest number of adaptations by a shortened span was for *scoot*, which came at the end of the line. Apparently the position of the word in the line has some effect upon the type of adaptation made in its interpretation.

PATTERNS OF REGRESSIONS ON TEST FACTORS IN SELECTION 4

Table IV summarizes the data on number of regression patterns for Selection 4 on test factors which were expected to produce such patterns. It will be seen from these data that the factors which were introduced to test the hypotheses as to the causes and nature of regressive movements have produced the expected results in a significant number of cases. Lines 8, 9, 10, and 12 were expected to cause regressions; not only are the total numbers of regressions for these lines signifi-

TABLE IV
PATTERNS OF REGRESSIONS ON CERTAIN TEST FACTORS IN SELECTION 4

Line	PATTERNS			All Patterns	Shortened Span	No Dif- ficulty	Number of Cases.
	Word Analysis	Phrase Analysis	Line Analysis				
8 (scriptgiser)-----	25	-----	4	29	0	1	30
9 (cowgirl)-----	-----	9	11	20	6	4	30
10 (hot-headed)-----	5	9	5	19	4	7	30
12 (picture)-----	-----	11	6	17	3	10	30
16 (gisscriter)-----	22	2	-----	24	-----	6	30
Total-----	52	31	26	109	14	28	150
Per Cent-----	48 _b	29 _b	23 _b	73 _a	9 _a	18 _a	100
12 (humann)-----	2	1	-----	3	10	17	30
13 (bigest)-----	6	3	-----	9	3	18	30
15 (skillfull)-----	1	1	-----	2	7	21	30

a. One record could not be analyzed for pattern because of movement.
b. Based on total number of patterns.
c. Based on total number of cases.

cantly high, but so also is the total number of patterns produced.

There were, for the thirty subjects whose records were such that they could be analyzed by patterns, a total of 109 regressive patterns on the five lines. This is 73 per cent of the total cases where such patterns were possible. Only 18 per cent of the cases were unaffected by the difficulty, while in 9 per cent adjustment was made by shortening the span of attention.

Of the total number of regression patterns, 48 per cent were word analysis. Of the 52 cases of word analysis patterns, all but 5 were caused by the two words *scriptgiser* and *gisscriter*. Only one subject showed no effect on her eye-movement pattern by the presence of the first of these words. Two other subjects were stopped only momentarily by *scriptgiser*. One of these made four fixations on the word, but no regressions; the other returned to the word after reading over the rest of the line. The median number of fixations falling on the first third of the line containing this word for the remaining subjects was 9. The line seems to have been read in two ways: either the subject concentrated on this word and then went on to the rest of the line, or he left the word momentarily and then returned to have an-

other try at it after reading the rest of the line. Many records show that the reading of the rest of the line was badly upset by, apparently, the tension introduced by failure to recognize and make meaning from *scriptgiser*. Figure 7 shows a typical word analysis pattern over this word.

The word *gisscriter* in line 16 also produced typical word analysis patterns. Six subjects paid no extra attention to it and read the line through with great facility. Twenty-two subjects analyzed the word, and only two went beyond the word in a phrase analysis pattern that would indicate that they were trying to relate it to its context.

Line 9 in Selection 4 proved by all measures to be the hardest to interpret. The reason for this is obvious; the introduction of a fallacy in meaning is comparable as far as interpretation of words in context is concerned to the use of an unrecognizable word in line 8. That such a factor should cause more trouble than a vocabulary difficulty is thought-provoking. Four subjects read this line through with the type of eye-movement pattern that is expected of a very good reader. Perhaps it is significant that every one of the four had showed in his reading of the preceding line attempts to analyze the meaning of

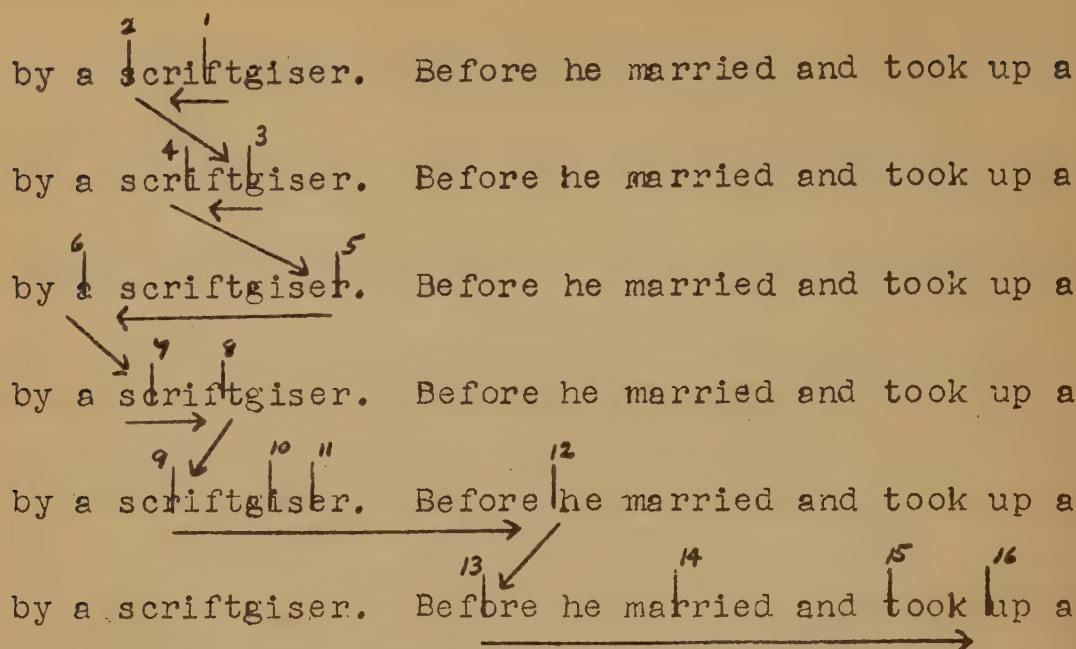


Fig. 7.—Word analysis pattern of regressions in the reading of line 8, Selection 4, by Subject 7.

scriptgiser. It would seem as though they recognized the similarity in the two situations and decided to react differently to this one. After they had read the test selections at the time of making the records, six subjects commented on the use of the word *cowgirl*. Three of these people were in this group who were unaffected, as far as their eye movements were concerned, by this factor in the line, so it would seem that they had taken in the word during their reading. Nineteen subjects mentioned *cowgirl* in the comprehension check.

There were three typical reactions to this line on the part of the rest of the subjects. Six of them read the last word carefully, but did not regress from it; 9 reexamined the second half of the line. Eleven reread the whole line, sometimes again and again. Figure 8 gives an example of analysis over the entire line.

The pattern of regressions for line 10 in Selection 4, which contributed 12 per cent to the total number of internal regressions for this selection, and which had an average of 2.6 regressions per subject on it, is for 9 subjects that of phrase analysis, extended here to cover the two words, *hot-headed fist-shaker*. Seven subjects had no trouble with this line. Five subjects showed a line analysis

pattern complicated enough to suggest great tension. Five people analyzed one word or the other, while four adjusted to the words by shortening their span of attention so that several fixations placed close together fell on the words.

Eleven subjects showed phrase analysis regression patterns for line 12 which indicated trouble in interpreting the first part of the line, *picture in this book*. For only six was there analysis of the line. The predominance of phrase analysis as the favored reaction to this test factor is in keeping with the results on Selection 3, where it was clear that interpretation of shifts in the meanings of words calls for re-examination of the context in which the words appear.

The misspelled words at the ends of two lines in Selection 4 caused only 5 regression patterns in all, though there were 17 adjustments by shortened span of attention. For the misspelled word appearing within the line, there were more regression patterns (9) than adjustments by shortened span (3). In all three cases of misspelled words the subjects were apparently reading for ideas and 18 were not stopped by the misspelling, if they noticed it. Probably the fact that the extra letter on two of the words appeared at

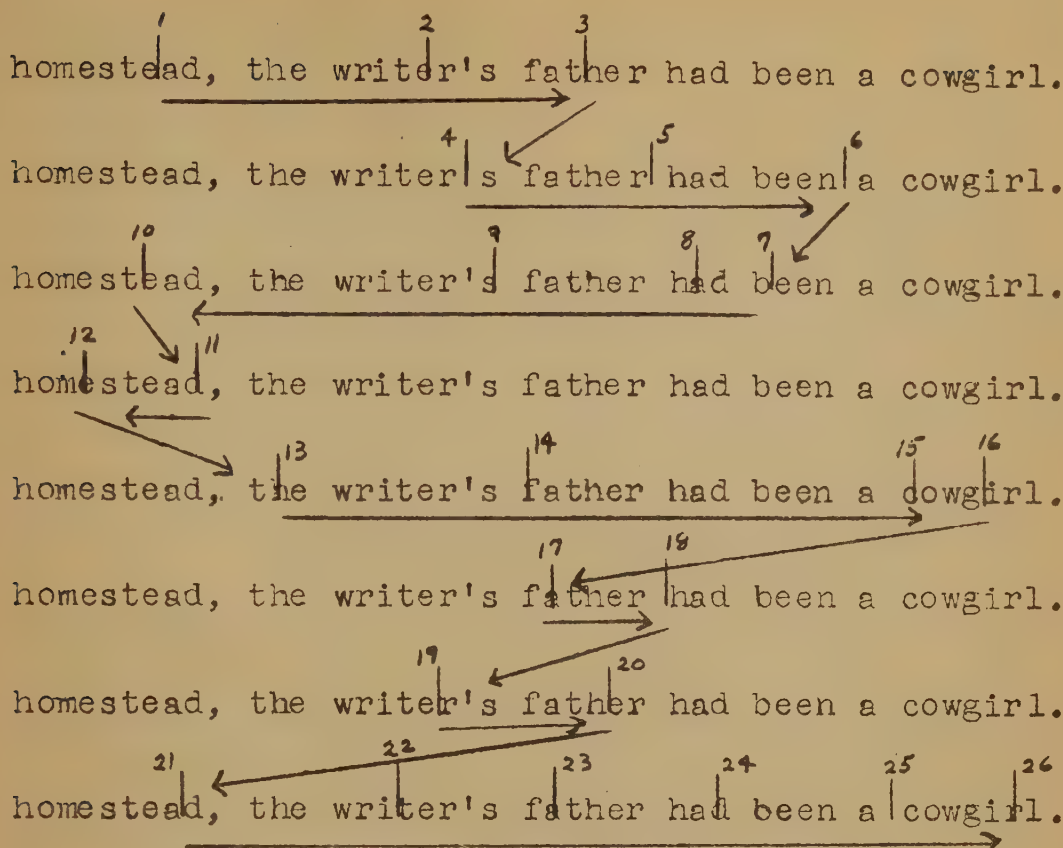


Fig. 8.—Line analysis pattern of regressions in the reading of line 9, Selection 4, by Subject 9.

the very ends of the lines means that it was seen in each case with peripheral vision; if the reader's attention was caught by the misspelling, he looked again. This behavior may provide evidence as to what happens when corrective regressions are needed. Something on the fringes of peripheral vision to the right catches the reader's attention and makes him fixate too far to the right. Then he must make a regression to tie up the new perceptual unit with the preceding one.

One other factor remains to be discussed in relation to internal regressions in Selection 4. Two lines, 7 and 14, contrast sharply in the amount of white space they contain. Line 7 is made up of 11 short and very common words, while line 14 has only 5 words, which are easy to understand, but not quite so common as those in line 7. The results on these two lines also contrast sharply in the

median number of fixations produced—9.1 fixations for line 7 and 6.2 fixations for line 14. The median number of internal regressions for line 7 is 1.4, and for line 14, 1.6 regressions. These figures seem to show that a line consisting of many short words is read with a larger number of fixations than is a line made up of a few long words. Apparently this factor of word length has little effect on regressions. The other evidence of this study points to the nature of the text rather than its physical appearance as a cause of regressions.

The last test line in Selection 3 consisted of only six words, *constructing sentences of mouthings and blabberings*. The medians for this line are 6.2 fixations and 0.1 regression. Selection 5 also offers evidence as to the effect of many short words.

PATTERNS OF REGRESSIONS ON SELECTION 5

As has been already pointed out, the patterns of eye movements on Selection 5 differ in many ways from those on the other test selections. There was a general tendency on the part of the subjects to adapt to difficulty by proceeding over the lines with a shortened span of attention and with fewer patterns produced by regressions. That 28 good readers all tended to read this selection in this way may be due to the abstractness of the ideas in the selection, to the varying lengths of the lines, or to the "openness" of those lines. Introspection suggests that the use of many short and familiar words in succession has a tendency to slow down our reading, because we cannot know what the key words are or group the words into familiar patterns. When such short and common words as those found in this selection are used in connection with longer words, we find it easier to find units of meaning among them. This is comparable with the reading of numerals, where attention must be paid to each digit, since the combination of digits is constantly varying and configuration is no help to recognition, as it is with words. In some such way as this the reading of Selection 5 may have been affected by the "openness" of the lines and the type of vocabulary used. The evidence from line 7 in Selection 4 suggests this kind of reaction to such lines. However, the need for grasping an abstract idea may have had its effect also, though it might be argued that this would lead to regression patterns rather than to a shortened span of attention. The reader must get an overview of what he is reading before he can adapt to ideas, while perceptual factors present themselves immediately. The tendency to use longer fixations for this selection than for the others was apparently an adaptation to the requirements of interpretation.¹

The data on the regressions for each line of Selection 5 cannot be discussed in the same way as for Selections 3 and 4, because of the fact that the lines were not of the same length in Selection 5 and the totals are affected by this. But when the results for lines of similar length are compared, rather striking contrasts are noted. Table V presents the data on internal regressions for

¹ The average duration per fixation for all subjects was 7.0 thirtieths of a second for Selection 1-x, 7.1 thirtieths for Selection 3, 7.3 thirtieths for Selection 4, and 7.4 thirtieths for Selection 5.

Selection 5 in such a way that these lines can be compared. It will be seen from this table that there are differences between lines of the same length and comparable idea, larger for lines 8 and 15 than for the other pairs. The advantage is with the line appearing in the second stanza of the poem in five cases and with the line appearing in the first stanza in the other case. Because of the difficulty of telling when the subjects stopped reading the last line, it cannot be plotted, so no comparison can be made between lines 13 and 20.

TABLE V
INTERNAL REGRESSIONS ON COMPARABLE
LINES IN SELECTION 5

Line	Internal Regressions	Average For Line	Per Cent Contributed to Line
7-----	57	2.0	8
14-----	37	1.3	5
8-----	104	3.7	14
15-----	52	1.9	7
9-----	87	3.1	12
16-----	72	2.6	10
10-----	67	2.4	9
17-----	43	1.5	5
11-----	56	2.0	7
18-----	64	2.3	9
12-----	41	1.5	5
19-----	33	1.2	4

Line 7 is comparable to line 14 in length and structure, except for the inverted order in *biography famous*. Too much reliance cannot, however, be put upon the difference in the number of internal regressions on the two lines. Although six lines had been read before the subjects began the actual poem, the difference in the nature of the preliminary lines and those in the poem may have caused an unnatural manner of reading line 7. However, 12 subjects showed an analysis pattern resulting from regressions over the phrase, *biography famous*, which may have been caused by the inverted order or by the process of interpreting the words. No such pattern is shown in the records on line 14 for ten of these subjects.

Line 8 is comparable to line 15. There is a difference of 52 internal regressions in the total numbers for the two lines. The average per subject for line 8 is 3.7 internal regressions and for line 15, 1.9 internal regressions.

The variable factor in these lines is the punctuation introduced in line 15 in contrast to the absence of punctuation in line 8. The thought in the two lines is different enough to obviate practice effect upon the second from the reading of the first.

In only 3 records out of the 28 secured on this selection was line 8 read with the same facility as line 15. In 5 records the subjects seemed to have difficulty with both lines. The remaining 20 subjects showed by patterns of regressions on line 8 that they were finding the line hard to interpret, and showed fairly regular progress across line 15.

For 25 subjects who had difficulty with line 8 two patterns stand out. Fourteen subjects showed a tendency to analyze the first third of the line. Eleven subjects adapted to line 8 by analysis of the whole line. Figure 9 illustrates adaptation by line analysis. Subjective evidence tends to show that the lack of punctuation in line 8 makes it very hard to interpret. Without punctuation, the relationships of the words to each other must be puzzled out by rereading. Probably the subjects who showed phrase analysis patterns on the first part of the line were affected by the lack of punctuation. The other subjects who analyzed other parts of the line may also have been affected by the lack of punctuation, but were probably also affected by the need to answer a specific question on the idea expressed in the line, mentioned in the preliminary lines on this selection.

Examination in detail of the patterns of eye movement on the other lines shows no great differences in the patterns caused by regressions, with the exception of line 10. The rather sharp contrast seen between the numbers of internal regressions for lines 10 and 17 is probably due to a vocabulary factor in line 10. The word *ought* caused regressions indicating word analysis for 11 subjects, phrase analysis for 2 subjects, and line analysis for 2 subjects. No such difficulty is found in line 17.

With these exceptions there is great uniformity for each subject in the patterns of eye movements for the pairs of lines. The few places where fixations tend to pile up on a line, never outstanding as in Selections 3 and 4, seem to be determined entirely by individual reactions to the general implications of the ideas presented. Even for line 18, where the number of regressions rises over that for line 11, there is no uniform factor of difficulty.

SUMMARY AND INTERPRETATION

Cause of regressions.—Analysis of the data from this experiment provides striking support for the following hypotheses concerning the causes of regressive movements in reading.

1. Regressions appear when some factor interrupts the flow of thought during reading, as well as when perception is inadequate.

2. Inadequate perception may be the result of eye movements which overreach or

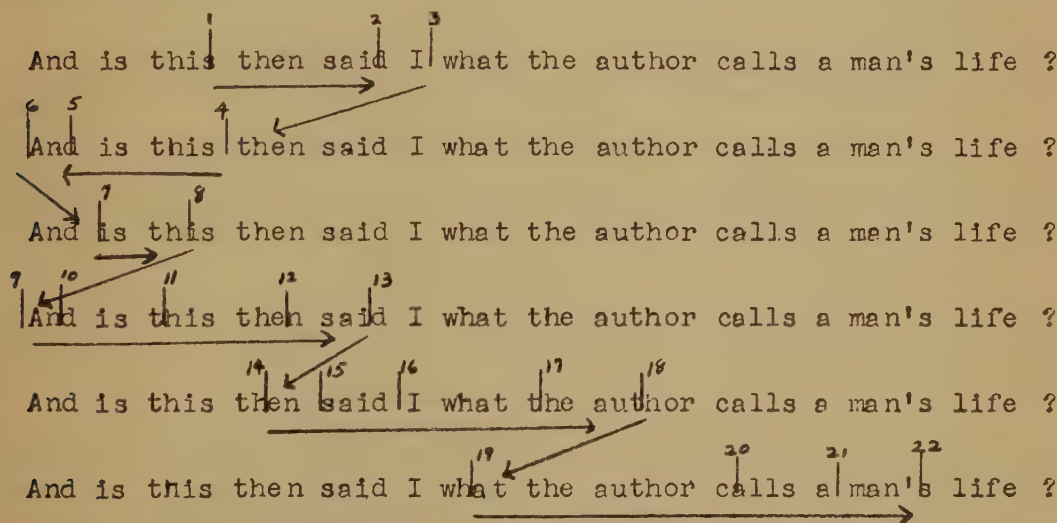


Fig. 9.—Line analysis pattern of regressions in the reading of line 8, Selection 5, by Subject 14.

underreach the limits of the reader's span of recognition.

3. Failure to recognize the basic meaning of a word may interrupt the continuity of thought processes during reading. An interruption of this nature will be characterized by regressions which analyze the word before the reading proceeds.

4. Failure to recognize the correct meaning for a word within its context may also cause regressions while an unsuitable meaning is being rejected in favor of one which fits into the context.

5. Failure to combine the meaning of a word properly with that of other words with which it appears may cause regressions.

6. Failure to relate the meaning of the word to the conditions under which it is used may interrupt the thought processes going on during reading, and this interruption will be reflected in regressive movements.

In addition to supporting the foregoing hypotheses, the data from the experiment suggest that failure to relate word meaning to context may be the result of a misleading connotation of the word. It may also be due to the fact that the referent of the word is not clear to the reader. Figurative language may also cause such failure to understand a word correctly in context.

Furthermore, the data seem to indicate that failure to combine the meaning of a word correctly with that of other words may be due to an inability to grasp sentence relationships, to a misunderstanding of word functions, or to a failure to catch a shift in the meaning of words.

When the reader is not alert to the author's mood and intention, he may not relate the meaning of a word to the conditions under which it is used. He may then be forced to regress in order to analyze apparent inconsistencies.

The analysis presented in this study reveals very clearly that the large majority of regressions serve the purpose of permitting the reader to re-examine all available clues to meaning within the material read. Consequently they represent a mode of adjustment to difficulty in interpretation. As such, they must be regarded as necessary parts of the reading process under those conditions where detailed search for meaning is required, in contrast to situations calling for simple assimilative reading.

The nature of regressions.—Difficulties in reading which call for analysis are reflected in the nature of the regressions used. This study supplies convincing evidence of the validity of the hypotheses to the effect that regressions tend to fall into six patterns. The first two of the patterns are related to inadequate perception, the last four to inadequate interpretation.

1. Initial regressions are adjustments following the first fixation on a line when the reader has failed to connect the end of the preceding line with the beginning of this one, either physically, with the proper arc of movement of the eyes, or mentally, with a suitable joining of the ideas represented.

2. Corrective regressions are internal regressions which serve to tie up fields of vision when the forward movement of the eyes in reading has overreached the span of recognition. The regression is used to make the necessary adjustment for successful perception, and resembles the initial regression in this respect.

3. Reference regressions are brief reexaminations of a textual element and serve the purpose of verification or of recall. They are infrequent and are, as the name implies, rapid references to something already read when a review of that element will assist in the interpretation of the new material under consideration.

4. Word analysis patterns of regressions are limited to a reexamination of a single word, and come about when the form or basic meaning of the word does not rise into consciousness during perception.

5. Phrase analysis patterns of regressions are adaptations to difficulty in apprehending the meaning of a combination of words, and serve to review several words in sequence. They are related to failure to recognize the meaning of a word within its context, failure to combine the meaning of a word with that of other words with which it appears, and failure to relate the meaning of a word to the conditions under which it was used. For skilled readers this is the most frequent pattern of regressions.

6. Line analysis patterns of regressions are characterized by a reexamination of the whole line. This pattern is a method for meeting failure to get the implications of a still larger unit of meaning than that which causes the phrase analysis pattern.

Any one of the three analysis patterns—word, phrase, or line—may arise from failure to interpret, as well as from attempts to interpret.

The first two patterns of regressions—initial and corrective—are likely to appear in all kinds of reading. They may be more frequent for skilled readers than for unskilled, inasmuch as such readers show a wider span of recognition than unskilled, and so are more likely to overreach in their forward movements. These patterns may also be more frequent in simple assimilative reading than in analytical reading, since in such reading the forward movement is likely to be more rapid and more confident.

The last four patterns of regressions are not likely to appear so often in simple assimilative reading as they are in reading that requires thoughtful interpretation, though they may appear even in easy material for readers whose habits of attack upon textual materials are immature.

Significance of study.—The findings of this study emphasize two facts: first, that regressions of the analysis pattern types serve a definite purpose in reading; and second, that the number of regressions needed for such patterns is dependent upon the success of the interpretation resulting from them. These have important implications for all teachers who are concerned with the teaching of reading or with guidance in reading.

Judd¹ has pointed out that the problem of "confusion periods" resulting from failure to recognize words must be met by adequate methods of teaching word analysis. Judd and Buswell² have pointed out that teachers must

guide pupils in making intelligent attacks upon textual materials when "study" situations cause confusion in method and purpose.

Methodology in reading has supplied means for meeting the situation insofar as word recognition is concerned. However, as yet no adequate teaching methods have been devised for training pupils in meeting the problems of interpretation inherent in shifts in the meanings of words, changes in the author's mood and intention, figurative language, word relationships, and sentence structures. Research is needed to develop methods adapted to these situations.

Then, again, the whole field of the teaching of reading has suffered from failure to draw clear-cut distinctions between simple assimilative reading and that type which calls for careful interpretation. Research should be concentrated upon finding techniques for meeting both situations; so far it has been concerned primarily with the first type.

Recognition of the difference between these types of reading, and appreciation of the problems inherent in the second type, are the business of those teachers who develop reading programs, as well as of those who teach reading. It has been shown in this study that even skilled readers are not as efficient as they might be in meeting the sort of difficulty that much of their reading presents. Pupils must be helped in every way possible to meet the demands interpretation puts upon them. They must not be discouraged from regressing when regressions serve an honest purpose. They must be shown where to look for help within the text, and how to make use of re-examination of textual materials as an aid in successful interpretation. Only in this way may a serious danger be avoided—the tendency toward superficial reading brought about by too much emphasis upon techniques suitable only for simple assimilative reading situations.

¹ Charles H. Judd, *Reading: Its Nature and Development*. Supplementary Educational Monographs, No. 10. Chicago: University of Chicago Press, 1918.

² Charles H. Judd and G. T. Buswell, *Silent Reading: A Study of the Various Types*. Supplementary Educational Monographs, No. 23. Chicago: University of Chicago Press, 1922.

